

[GBK202] MECHANICAL DESIGN OF MEDICAL EQUIPMENT

GENERAL INFORMATION

Studies	DEGREE IN BIOMEDICAL ENGINEERING		Subject	?
Semester	1	Course	3	Mention / Field of specialisation
Character	COMPULSORY		Language	ENGLISH
Plan	2022	Modality	Face-to-face	Total hours
Credits	4,5	Hours/week	3.86	69.5 class hours + 43 non-class hours = 112.5 total hours

PROFESSORS

TENA MERINO, IOSU

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
GRAPHIC EXPRESSION I	Mechanical Design
GRAPHIC EXPRESSION II	2D/3D design software (SolidWorks)

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GBR305 - To evaluate the mechanical needs of different medical equipment		x		3,78
G-RTR1 - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and /or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy		x		0,4
G-RTR2 - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language		x		0,32
Total:				4,5

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RGB390 [!] *Definir y gestionar los objetivos y la planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías específicas de su especialidad,- que en ocasiones llegan a la vanguardia del conocimiento- y definir una estrate*

LEARNING ACTIVITIES

	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	2,5 h.	1,5 h.	4 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
Observation (technical capacity, attitude and participation)

CH - Class hours: 2,5 h.

NCH - Non-class hours: 1,5 h.

TH - Total hours: 4 h.

RGB391 [!] *Coordinar el equipo de trabajo, estimulando la cohesión y buen clima para lograr la integración de todas las personas y su contribución para alcanzar un rendimiento apropiado, tanto a nivel individual como grupal, para el desarrollo del proyecto en*

LEARNING ACTIVITIES

	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	2 h.	1 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems Observation (technical capacity, attitude and participation)
CH - Class hours: 2 h. NCH - Non-class hours: 1 h. TH - Total hours: 3 h.		

RGB392 [!] *Identificar y argumentar de forma precisa los ODS en los que incide el proyecto realizado, aportando posibles acciones para la mejora.*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	2 h.	1 h.	3 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems Observation (technical capacity, attitude and participation)	
CH - Class hours: 2 h. NCH - Non-class hours: 1 h. TH - Total hours: 3 h.			

RGB393 [!] *Elabora la memoria del proyecto, aportando argumentos elaborados y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	2,5 h.	1,5 h.	4 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems Observation (technical capacity, attitude and participation)	
CH - Class hours: 2,5 h. NCH - Non-class hours: 1,5 h. TH - Total hours: 4 h.			

RGB394 [!] *Realiza una presentación oral del proyecto, justificando las soluciones propuestas con argumentos elaborados y precisos, y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams	2,5 h.	1,5 h.	4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems Observation (technical capacity, attitude and participation)
CH - Class hours: 2,5 h. NCH - Non-class hours: 1,5 h. TH - Total hours: 4 h.		

RGB313 [!] <i>Analiza y diseña los elementos mecánicos necesarios para los diferentes equipamiento médicos</i>			
LEARNING ACTIVITIES	CH	NCH	TH
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	18 h.	4 h.	22 h.
Carrying out exercises and solving problems individually and/or in teams	14 h.	20 h.	34 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests	
CH - Class hours: 32 h. NCH - Non-class hours: 24 h. TH - Total hours: 56 h.			

RGB314 [!] <i>Calcula, dimensiona y evalúa el montaje de los elementos mecánicos necesarios para los equipamientos</i>			
LEARNING ACTIVITIES	CH	NCH	TH
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	9 h.	2 h.	11 h.
Carrying out exercises and solving problems individually and/or in teams	17 h.	10,5 h.	27,5 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests	
CH - Class hours: 26 h. NCH - Non-class hours: 12,5 h. TH - Total hours: 38,5 h.			

CONTENTS

1. Kinematic chain modelling:
 - Modelling principles
 - Mechanical transmissions
 - Steady-state vs. transient conditions
2. Dimensioning of machine elements:
 - Rolling elements:
 - Rolling bearings
 - Ball screws

Guiding systems

- Belt transmission

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	MOTT, Robert L. Diseño de elementos de máquinas. Pearson Prentice Hall (2006)
Technical articles	DECKER, Karl-Heinz. Elementos de máquinas (Manual del Ingeniero Técnico, Volumen XIII) URMO
Class presentations	BUDYNAS, Richard. Diseño en ingeniería mecánica de Shigley. McGraw-Hill Interamericana de España S.L.; Edición: 8 (26 de febrero de 2008)
Video projections	NORTON, Robert L. Diseño de Máquinas. Norton, Robert L. (2010)
Student book	HARNOY Avraham. Bearing Design in Machinery. Engineering Tribology and Lubrication Marcel Dekker, Inc (2003)
Slides of the subject	BRANDLEIN, J. Ball and Roller Bearings Theory, Design, and Application. John Wiley Sons, Ltd. (1999)
	HARRIS, KOTZALAS. Advanced Concepts of bearing Technology. Taylor & Francis (2007)
	HUNG NGUYEN-SCHÄFER. Computational Design of Rolling Bearings. Springer (2016)
	ERWIN V. ZARETSKY. Rolling Bearing Life Prediction, Theory and Application. Glenn Research Center, Cleveland, Ohio (2013)
	https://nt.rs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20130011515.pdf
	HUGH SPIKES. Basic of EHL for practical application. Lubrication science 2015; 27:45-67
	CHILDS, Peter RN. Mechanical Design Engineering Handbook (2nd edition). Butterworth-Heinemann (2014)
	BUDYNAS, Richard G. eta all. Shigley's Mechanical Engineering Design (9th edition). Mc Graw Hill (2011)